Original Article

Transformative process of adventure tourists as cross-boundary learners:
A case study of totally protected areas in Sarawak

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Abstract
This study examines adventure tourists who have recently become transformative tourists. Transformative tourism, based on transformative learning theory, induces internal change through accidental learning and discovery from disorienting dilemmas. Therefore, viewing adventure tourists as learners, the study hypothesizes explicitly that they are cross-boundary learners. It focuses on the non-cognitive abilities that facilitate this learning and investigates how these abilities are linked to transformation. Using qualitative comparative analysis, the study investigates how learning ability, behavior (agency), and future transformation interact among foreign adventure tourists (N = 26) in totally protected areas in Sarawak. The findings confirm the hypothesis, revealing that tourists possess the necessary non-cognitive abilities for cross-boundary learning and transformation. Notably, even without demonstrating agency, they achieved self-transformation due to their high non-cognitive abilities. This suggests they can become cross-boundary learners and that a process exists that allows them to flexibly select and generate their preferred context for either knowledge exploration, knowledge exploitation, or both, depending on the situation. The cycle of cross-boundary learning indicates that self-transformation can be both a motivation and an outcome of travel. This insight may help to bridge different epistemological perspectives on self-transformation in tourism psychology and tourism anthropology/sociology.

Keywords
transformative tourism, adventure tourism, cross-boundary learning, non-cognitive abilities, totally protected areas

1. Introduction

Adventure tourism (AT) has expanded rapidly world-wide, with the market projected to reach USD 1,947.5 billion by 2032 [Allied Market Research, 2023]. AT generally combines physical activity, natural environments, and cultural immersion [World Tourism Organization, 2014]. Recent studies indicate that contemporary adventure tourists increasingly seek self-transformation, learning, and expanded worldviews rather than only thrill-seeking experiences [Viren et al., 2017]. These tourists, often referred to as transformative tourists, are characterized by an interest in local cultures, sustainability, and personal growth [World Tourism Organization, 2016]. Previous studies also suggest that contemporary adventure tourists often display ambivalent travel styles, combining comfort-oriented consumption with a willingness to step outside their comfort zones during travel [International Finance Corporation and ATTA, 2019].

Transformative tourism research draws heavily on transformative learning theory [Mezirow, 1991], which explains how individuals revise their assumptions and worldviews through "disorienting dilemmas." In tourism contexts, encounters with unfamiliar cultures, life-styles, and environments can function as such dilemmas and trigger self-transformation [Tomljenovic & Ateljevic, 2015]. Consequently, transformative tourism research increasingly views tourists not merely as consumers, but as learners engaged in reflective and experiential processes [Lean, 2012; Coghlan and Weiler, 2018].

Previous studies suggest that transformative tourism experiences are often facilitated through interaction with local communities and participation in communities of practice [Sheldon, 2020]. Building on this perspective, Akaho [2024a; 2024b] conceptualized adventure tourists as "cross-boundary learners" who engage in both knowledge exploration and knowledge exploitation while navigating unfamiliar cultural contexts. However, the mechanisms through which adventure tourists intentionally engage with disorienting dilemmas and achieve self-transformation remain insufficiently understood.

This study examines whether adventure tourists who become transformative tourists can be understood as cross-boundary learners. Specifically, it investigates how non-cognitive abilities, agency, and self-transformation interact among foreign adventure tourists visiting Totally Protected Areas (TPAs) in Sarawak, Malaysia. Using qualitative comparative analysis (QCA), the study explores the dispositions that facilitate cross-boundary learning and the process through which these dispositions contribute to transformative outcomes.

2. Research methodology

2.1 Outline

This study aims to validate whether adventure tourists who have transformed into transformative tourists possess non-cognitive abilities suitable for cross-boundary learners, whether they exercise agency, and how these relate to self-transformation. The antecedents were defined as dispositions in the previous section that determine tourists' engagement and abilities.

First, the theoretical background of the study is presented. Disposition falls under attitudes and values, one of the three elements (knowledge, skills, attitudes and values) that form

competencies. These can refer to the tendency to react in a particular way to a situation due to existing values that influence judgment and behavior, traits such as optimism or pessimism, risk aversion or curiosity [Organization for Economic Co-operation and Development, 2019a]. These traits, which cannot be measured by paper tests, such as optimism and curiosity, are termed "non-cognitive abilities" [Tough, 2013]. The Organization for Economic Co-operation and Development [2019b] refers to them as social and emotional skills, which include other skills that support communication, such as empathy and respect for others, as well as responsibility, self-efficacy, and other goal-achievement skills. These non-cognitive abilities can be measured using scales developed in the psychological domain.

Chandler and Lusch [2015] categorized dispositions in actor engagement into three categories: past disposition, which seeks to transform from past experiences; present disposition, which is the "agency" that drives actors; and future disposition, which is the capacity to integrate resources. Non-cognitive abilities are qualities that a person has already acquired and, therefore, correspond to past dispositions. Agency refers to the autonomy of the active actor in change [Hamilton, 2019]. In Service-dominant (S-D) logic, value co-creation occurs in A2A (actor to actor) networks, where all actors are regarded as operant resources that mutually influence and shape each other, thus extending their application to individuals [Lusch and Vargo, 2012]. These actors are resource integrators who possess an agency and integrate their operant resources along with those acquired from the market [Lusch and Vargo, 2014]. Conversely, as AT is a service, the transformative tourist is expected to exercise this agency and engage in resource integration.

This aligns with the ecological-psychological considerations discussed by Urry and Larson [2011], which state that tourist performances are influenced by the perception of affordances provided by the space in which the activity occurs. Affordance, as defined by Gibson [1979] and referenced by Urry and Larson [2011], refers to the possibilities for action that environmental elements offer to actors. Effectivity, an attribute of the actor that enables them to perceive and act on affordances is refers to by Honda [2005]. As noted by Vaz et al. [2017], effectivity cannot function as capability unless it aligns with affordance. Therefore, effectivity is categorized as a past disposition, agency (present disposition) refers to the behavior exercised in response to affordance, and capability which results in resource integration (leading to self-transformation), is considered a future disposition.

Based on the preceding studies, dispositions are classified into past-, present-, and future-oriented categories and adopted as the theoretical analytical perspective of this study.

Second, as a research method, a case study of foreign tourists visiting nature parks in Sarawak, Malaysia, was adopted as the research subjects. Previous AT research used as data sources in this study targeted adventure tourists from the USA, Europe, and Australia. Since these tourists show a strong interest in different cultures, conducting research in a non-Western region where the "disorienting dilemma" can be anticipated is an effective approach. The 15 nature reserves, 5 wildlife sanctuaries, and 47 national parks in Sarawak are collectively referred to as Totally Protected Areas (TPAs) and are managed by the Sarawak Forestry Corporation (SFC) (Sarawak Forestry Corporation, n.d.). Data were collected from foreign (non-Malaysian) tourists in four of the TPAs that are open to visitors and have been permitted for surveys by SFC: Bako National Park, Niah National Park, Semenggoh Nature Reserve, and Fairy Cave Nature Reserve. The research was conducted between September 10 and 27, 2023.

The TPAs in Sarawak are suitable for this study as they fulfill all three elements of AT. In addition to the natural elements (flora, fauna, and landscape in the rainforest) and activity elements (e.g., hiking) within the TPAs, which are popular with tourists, there are also many different cultural elements for Western tourists. For example, Bako National Park is accessible by boat, and operated by a local fishing village, where traditional fishing can be seen along the way. At Niah National Park, tourists can observe local people collecting bat dung, which is sold at a high price as a high-quality fertilizer and harvesting ropes for swiftlet nests. Such locations, with its raw natural beauty and cultural authenticity, is highly valued. The TPAs at the study site meet these criteria. Signage in the park is generally written in both English and the local language. Additionally, SFC staff, who serve as park administrators, are proficient in English, as are the park guides. Entrance fees for foreign visitors are set at 20 RM for national parks, 10 RM for Semenggoh Nature Reserve, and 5 RM for Fairy Cave Nature Reserve, which are reasonable compared to local market prices. Except for park entry fees, there is no double pricing for foreign tourists.

The data collection methods employed in the case study comprised both qualitative and quantitative approaches. Qualitative data were gathered through participant observation of the tourists' travel activities, while quantitative data were collected through a structured questionnaire designed to measure non-cognitive abilities. Detailed information about the survey is provided in Section 2.3.

Finally, the data were analyzed using Qualitative Comparative Analysis (QCA) as proposed by Ragin [1987], which allows for a strong explanatory model despite a small sample size. Unlike grand theories in tourism anthropology and sociology, which rely on interpretivism, this approach allows for testing moderate generalizations without requiring large samples, bridging theory and practice [Rihoux and Ragin, 2009]. It also integrates interpretive analysis with quantitative data, capturing qualitative differences without disregarding outliers [Mello, 2021]. This makes it possible to track internal changes in adventure tourists who experience self-transformation, even when they fall outside the average. In this study, a four-valued fuzzy set is utilized, with causal conditions categorized as 1 for full attribution, 0.67 for considerable attribution, 0.33 for

partial non-attribution, and 0 for non-attribution. The analysis was conducted using fs/QCA software (Version 4.1), which supports fuzzy set analysis.

2.2 Research subjects

This section describes the specific research subjects. The number of subjects who can be observed each time ranges between two and four, as participant observation is carried out by accompanying individuals on activities within the TPAs, such as walking and hiking to enjoy the rare flora, fauna, and landscapes.

Except for Bako National Park, all study participants joined guided adventure tours where English-speaking guides provided instruction. In this case, local travel agencies arranged the tour, and we accompanied the participants. At Bako National Park, one of the nine visits included local tour participants, while on the other eight occasions, we randomly approached travelers waiting for barge transport, as boats were required to enter the park. A total of 36 participants agreed to participant observation and received a paper copy explaining the study, along with a quick response code for the questionnaire. The deadline for submission was October 6, 2023, and 26 participants responded. Each questionnaire had a code in the upper right corner, matching the code assigned to field notes. This ensured responses could be linked to observations without collecting personal information. Regarding the respondents' place of origin, data were collected mainly from so-called Westerners, as expected: 3 from Asia, 20 from Europe, 1 from North America, and 2 from Oceania. Additionally, there were 9 males and 17 females, with the majority being female. The number of subjects and their flow lines in each research location are summarized in Table 1.

Furthermore, the following five items were included in the questionnaire to pre-confirm the research subjects conformed to the characteristics of subjective adventure tourists identified in previous studies, thereby validating their suitability for the study:

a. Length of time required for scheduling
b. Degree of awareness of different cultural perceptions
c. Travel-style ambivalence
d. Educational background
e. Household economy

Item (b) refers to awareness of one's own customs and culture after traveling, while item (c) refers to whether one prefers a tailor-made luxury tour organized by a travel agency, a backpacking style where one plans their own trips, or both.

2.3 Research content

2.3.1 Questionnaire: Causal condition (1) scales and reasons for the adoption of non-cognitive abilities

Judgments are made regarding whether individuals possess the necessary competencies for cross-boundary learning, specifically focusing on past dispositions (non-cognitive abilities). This section details the reasons for adopting each non-cognitive ability measured in the questionnaire and the scales used. The scales, developed in the psychological domain, include reverse questions and utilize a five-step semantic differential method. Each ability was assessed through three questions,

Table 1: Line of flow of the research subjects

		Calibration score				Notes
		1	0.67	0.33	0	
Pre-trip indicators (1)	Curiosity	25 points and over	24-19 points	18-13 points	12 points and below	30 points in total for six questions.
	Each non-cognitive ability except above	13 points and over	12-10 points	9-7 points	6 points and below	15 points in total for three questions.
Pre-trip indicators (2)	Schedule	Less than 1 month	Less than 5 months	Less than lyear	1 year and more	
	Culture perception	5 points	4 points	3-2 points	1 point	5 (high)-1 (low)
	Ambivalence	Both (a) and (b)	(a) Prefer self made backpacker style	(b) Prefer tailormade tour provided by operator	Neither	Travel-style ambivalence
	Academic record	Master and above	Bachelor	Diploma	Highschool and below	
	Economy	10-8 points	7-6 points	4-5 points	3 points and below	Comparison of household finances in own country (10 steps)
Post-trip indicators	–	13 points and over	12-10 points	9-7 points	6 points and below	15 points in total for three questions.

Note: The author had translated and made additions based on the reference to Akaho (2024c).

except for curiosity, which was assessed through six questions due to the extensive five-dimensional curiosity scale [Kashdan et al., 2020] that was used.

Firstly, regarding "curiosity" and "optimism," these measures assessed the openness required for cross-boundary learning. Boundaryless careers and entrepreneurial dispositions that embrace "disorienting dilemmas" have been linked to varying degrees of openness within the Big Five personality traits [Goldberg, 1992; Zhao and Seibert, 2006; Zhao et al., 2010; Wang et al., 2016]. The five-dimensional curiosity scale [Kashdan et al., 2020] was adopted to measure curiosity. The life orientation test is widely used to measure optimism, and the revised life orientation test by Toyama [2013] was adopted for consistency. Optimism, considered necessary for acting without extensive planning, was also adopted as a measure of adventurousness.

Next, "self-efficacy" and "empathy" were assessed using questions from the General Self-Efficacy Scale [Sakano & Tojo, 1986] and the Interpersonal Reactivity Index [Himichi et al., 2017], respectively. Although these abilities are not typically developed through AT targeting adults, they have been reported to increase through transformative tourism [Brown, 2009]. Therefore, measuring these abilities can provide insights into the formation of a community of practice and the development of tolerance for different cultures.

"Grit," or resilience, involves persistence and consistency of interest [Hattie et al., 2021]. A higher level of grit (persistence) has been linked to positive emotions [Hill et al., 2016], which, according to Seligman's [2012] PERMA model, facilitate knowledge exploration or unlearning [Schwarz & Clore, 2003]. Therefore, questions from the grit scale [Duckworth et al., 2007] were adopted.

Regarding measures of unlearning in cross-boundary learning, Matsuo [2021] first mentioned learning orientation. One question from the work domain goal orientation instrument [Vandewalle, 1997], as adopted by Matsuo [2021], was included in the study. Furthermore, Matsuo [2019] identified critical reflection as essential for unlearning, referring to the ability to reflect on one's beliefs and routines. This was measured using scales for critical reflection [Kember et al., 2000; Peltier et al., 2005]. Grant [2011] also highlighted that high levels of cooperation might hinder challenging and positive discussions about new ideas, emphasizing the importance of maintaining a critical stance. Therefore, a critical attitude [Grant, 2011] was added to the questionnaire, and these three aspects were collectively measured under the name of "learning" in this study.

These non-cognitive abilities are referred to as "pre-trip indicators (1)," as they are inherent abilities and dispositions present before the journey.

2.3.2 Participant observation: Causal conditions (2) agency and observation methods

The non-cognitive abilities that facilitate cross-boundary learning and are investigated through a structured questionnaire are considered effectivities. It is necessary to determine whether individuals can exercise agency, given the affordances of the TPAs in Sarawak, which falls under present dispositions. Resource integration is based on demonstrating agency [Lusch and Vargo, 2014].

Participant observation involves accompanying adventure tourists without intervening through structured interviews. The results of these observations were categorized into the three elements of AT: cultural, nature, and activity. Field notes recorded during participant observation were unstructured, focusing on the diverse behaviors of the subjects.

The agency for cultural elements includes an interest in cultural resources in Sarawak, the number of questions asked to the accompanying author (a Japanese researcher) and local guides, as well as interest in other tourists from different countries within the same group. These behaviors were recorded to gauge their cultural engagement. The agency for natural elements reflects an interest in flora, fauna, and natural landscapes, which was captured through conversations and observed behaviors. For instance, expressing a strong desire to see proboscis monkeys and taking photos with a DSLR camera instead of a smartphone indicates strong agency towards nature elements. The agency for the activity element was recorded based on willingness to engage in activities such as hiking, as well as their equipment and travel behavior before and after visiting Sarawak.

The qualitative observations recorded provide the basis for data calibration in QCA in Section 2.4. Calibration of membership values in fuzzy sets is not done mechanically but relies on the researcher's practical and theoretical knowledge [Rihoux and Ragin, 2009]. For instance, the agency for the activity component differs between individuals prepared with hiking shoes and those in sandals, or between women who hiked in shorts and those who changed into long trousers before returning to the hotel, considering the presence of many Muslims in the area. Instead of an absolute quantitative assessment, such as the number of speaking utterances, the quality is assessed relatively by the author and calibrated to four values.

This form of agency based on participant observation is referred to in this study as "mid-trip indicators," as it records the journey in progress.

2.3.3 Questionnaire: Self-transformation as an outcome

This study adopts the definition by Christie and Mason [2003: 9] for self-transformation in transformative tourism research, which is "the practice of organized tourism that leads to a positive change in attitudes and values among all those who participate in the tourist experience." Given the abstract nature of self-transformation, it can be challenging for subjects to recall and identify its occurrence. Therefore, this study uses an operational definition where the expansion of the worldview after travel is considered a positive and sustainable change. Acquisition of a new worldview is a goal for transformative tourists [World Tourism Organization, 2016] as well as adventure tour-

ists [Viren et al., 2017]. Robledo and Batle [2017], for example, describe pilgrimages as the oldest form of transformative tourism. Pilgrimages to Santiago de Compostela, Spain, have been found to experience internal transformations, including changes in perceptions of their own values and worldview [Frey, 1998]. Although the exact moment of transformation may be unclear [Alhadeff-Jones, 2012], the exchange and integration of worldviews are believed to occur during the "reflection" process before the transformation process in the cross-boundary learning mechanism [Akkerman and Bakker, 2011; Gulikers and Oonk, 2019]. This justifies using worldview expansion as a measure of self-transformation.

Specifically, the questionnaire included the following questions to measure self-transformation:

1. Was the trip to Sarawak a good choice? (5-point scale)
2. Did travel in the TPA expand your worldview? (5-point scale)
3. Would you tell your friends and acquaintances about your experience in the TPA as a positive topic? (10-point scale).

These questions help determine whether participants perceived their experience as a positive transformation. The results from these questions were scored as indicators of self-transformation, demonstrating future dispositions.

This study refers to these measures as "post-trip indicators" or simply "outcomes," as they reflect changes occurring after the travel.

2.3.4 Raw data by calibration

In preparation for QCA analysis, data from the questionnaire and participant observation were calibrated into four values. Firstly, the questionnaire results involved assigning scores based on the rules in Table 2.

Their agency related to the three elements of AT, based on participant observation ("mid-trip indicators"), was evaluated by the author using field notes and assigned four values accordingly. For instance, the agency for activities varied based on equipment and fitness levels, even if the participants hiked the same trail. Similarly, the agency for natural elements considered not only interest in flora and fauna but also knowledge levels. The agency for cultural elements was evaluated based on the frequency of dialogue with people from different cultures and responsiveness to local food.

It is important to note that the number of favorable cases increases with the number of causal conditions analyzed. According to Mello [2021], the 26 samples in this study allow for the analysis of up to five conditions. Analyzing more than five causal conditions would be insufficient due to the small sample size. Considering the above, in addition to the six non-cognitive abilities described in this study, the questionnaire survey also asked questions originally developed by Busch [2020], who studied "serendipity," but these were excluded from this study to limit the number of causal conditions. Table 3 summarizes the results of the above calibrations. This will be analyzed using the software fs/QCA (ver. 4.1) released by Ragin in 2023 as raw data.

3. Research results

3.1 Results of the necessary conditions

This section discusses the consistency analysis results of necessary conditions in causal conditions. Consistency measures how well the outcome Y fits within condition X based on set theory. A minimum consistency threshold of 0.75 is recommended, with a desirable value being 0.9 or higher [Schneider and Wagemann, 2012]. Coverage, another important indicator, assesses how well condition X covers cases where outcome Y occurs; low coverage indicates an insignificant condition.

None of the pre-trip indicators (1) and (2) nor the mid-trip indicators demonstrated a degree of consistency greater than 0.9 concerning the outcome. Thus, none of the causal conditions were stand-alone necessary conditions (see Table 4).

3.2 Creation of truth tables

The next step is to analyze sufficient conditions. In the fs/QCA software, standard analysis was selected for sufficient conditions analysis, which can derive intermediate solutions. Unlike complex solutions, which do not consider logical remainders, or parsimonious solutions, which may use all logical remainders, intermediate solutions include only meaningful logical remainders based on the researcher's theoretical knowledge [Rihoux and Ragin, 2009].

To derive intermediate solutions, truth tables were created in the software. These tables show the configuration of causal conditions associated with the results. An entry labeled "number" shows how many cases are covered by the combination. The truth tables used in this study are presented in Tables 5-7. Table 5 displays the truth table with pre-trip indicators (1) as the causal condition for the outcome. Table 6 presents a truth table with mid-trip indicators as the causal condition. Table 7 presents the truth table with pre-trip indicators (2) as the causal condition.

The raw consistency refers to the proportion of outcomes that occur, and a consistency threshold of 0.95 or higher was used. If this threshold is exceeded, a value of 1, indicating full membership, is applied to the outcome column in the truth table. If it is less than this, a value of 0, indicating full non-membership, is applied. A large deviation between raw consistency and PRI (Proportional Reduction in Inconsistency) consistency suggests the combination of conditions may function even when the result does not occur [Mello, 2021]. SYM consistency considered a symmetric version of PRI consistency [Ragin, 2017], was not referred to in this study as it returned the same values as PRI consistency.

3.3 Sufficient condition analysis and results

This section conducts the analysis based on the created truth tables, referencing the results of the sufficient condition analysis (intermediate solutions). Explanation of terminology:

Table 2: Four-value calibration from the questionnaire

Name of the TPA	AT participation	AT Price/ person	No. of visits (No. of Subjects)	Weather *1	Onward transfer	On arrival at the TPA	Park transfers (onward)		Experience in the TPA	Park transfers (return)	Return
Bako National Park	No	–	8 (18)	Sunny	Departure from the city (by bus or shared ride taxi)	Registration of visitor information and payment of entrance fee.	Pay for boat*2 and board.	Presentation of entrance ticket and information on hiking trails (from SFC staff).	The hiking route is decided by consultation within the group. Short-cuts on the hiking trails (and visits to strange rocks on the sea) are possible for an additional boat fee. Lunch is taken in the designated cafeteria. Those who wish to rest may use the cafeteria.	The last boat at 15:00 returns on it. The area around the barge is a local fishing village with a fish market and restaurant.	Arrival in city (bus or shared taxi)
	Yes	380-450RM	1 (2)	Sunny	City departures (arranged vehicles)	Registration of visitor information and payment of entrance fee(by Tour guide)	Pay for boat*2(by Tour guide) and board.	Presentation of entrance ticket and information on hiking trails (from Tour guide).	The guide determines the hiking route based on the customer's physical fitness. Priority is given to areas where proboscis monkeys are likely to be seen. The route may also deviate from the track and pass through mangrove forests. Lunch is taken in a designated cafeteria. Guidance on traditional uses of plants is also provided.		Arrival in city (arranged vehicle)
Niah National Park	Yes	250-300RM	1 (2)	Sunny			Walk	Cross by boat on the way*3	First, the guide explains the origins of Nia National Park at the park's museum, before heading to the caves. The guide will lend you a headlamp as you will need one at the back of the cave. Inside the cave, the guide explains about the archaeological site and the life of the nearby inhabitants.	Return on foot. On the way, local residents sell folk crafts.	
Semenggoh Nature Reserve	Yes	300-380RM	2 (2)	Sunny	Rental mountain bikes from the customer's preferred location.		Paid park bus (if necessary)/ walk/mountain bike		The client moves to the orangutan feeding area to observe the orangutans. If no orangutans appear there, SFC staff will guide the customers on a walk through the forest to where the orangutans are located.	Paid park bus (if necessary)/ walk/mountain bike	Mountain bike rental to the customer's preferred location
Fairy cave Nature Reserve			1 (2)	Sunny			Walk		Guided walk through the cave. The cave has induction lights at the foot of the cave. After the cave, you come to an artificial terrace. From there up is a hiking trail, which requires hiring another guide at the entrance (the tour turns back here).	Walk	

Notes: *1 October (survey month) in Sarawak is the season when the rainy season is about to start, but the survey was conducted uniformly on sunny days. The climate is tropical with high temperatures (28-30°C) and high humidity during the daytime, except in the caves. *2 Tell the boat we chartered when we entered the park what time we will return (14:00 or 15:00) and it will pick us up. The group (up to 5 people) from the park entry will be on the same boat for the return trip, so they will basically be together. *3Although it is a small river, no bridge has been built on purpose, and local residents continue to make a living by operating ferry boats across it.

Table 3: Calibration table

CASE	Pre-trip indicators(1)							Pre-trip indicators(2)				Mid-trip indicators			Post-trip indicator
	Optimism	Efficacy	Empathy	Grit	Learning	Curiosity	Schedule	Culture perception	Ambivalence	Academic record	Economy	Activity	Nature	Culture	Outcome
1	1	1	0.67	0.33	0.33	0.67	0.33	1	0	0.67	1	1	0	1	1
2	1	0	0.67	0.67	0.33	0.67	0.33	1	0	1	1	1	0	0.67	0.67
3	0.67	0.67	0.33	0.67	0.67	0.67	0.67	1	0.67	0.67	1	0	0.67	0	1
4	0.67	0.67	0.33	0.67	1	0.67	0.67	0.33	0.67	0.67	0.67	0.33	1	0.33	1
5	0.67	1	0.67	0.67	0.67	0.67	0.33	0.33	1	1	1	0.67	0.33	0	1
6	1	0.67	0.67	1	0.67	0.67	0.33	0.33	0.33	0	0.67	0.67	0.33	0	1
7	1	0.67	0.33	1	0.33	0.67	0.67	0.33	1	0.67	1	1	0.33	0	1
8	1	1	0.67	0.67	1	0.67	0.67	0	1	1	0.67	0.67	1	0.33	1
9	1	0.67	0.67	0.67	0.67	0.67	0.67	0	0	0.33	1	0.33	0.33	0	1
10	0.67	0.33	0.67	0.67	0.67	0	0.67	1	1	0	0.67	0.33	0.33	0.33	1
11	0.67	0.67	0.33	0.67	0.33	0.33	0.67	0.33	0.67	0	1	1	0	0.67	0.67
12	1	1	0.67	0.67	0.33	0.33	0.67	0.33	1	0.33	0.67	0.67	1	0	1
13	1	0.67	0.67	0.67	0.67	0.67	0.33	0.33	0.67	0.67	1	0	0.67	0.67	0.67
14	1	0.67	0.33	0.67	1	0.67	0.67	0	0.33	1	1	0	0	0.33	0.67
15	0	0.33	1	0.67	0.33	0.67	0.67	1	0.67	0.67	0.67	1	0.67	0.67	0.67
16	0.67	0.67	0.67	0.67	0.33	0.67	0.67	0.33	1	0.67	0.67	1	0.33	1	1
17	0.67	0.67	0.33	0.67	0.67	0.67	0.33	0.33	1	1	0.67	0.67	0.33	0.33	0.67
18	0.33	0.67	0.67	0.33	0.33	0.67	1	0.33	0.67	0	0.67	0.33	0	0.33	1
19	1	1	0.67	0.67	0.67	1	0.33	1	0.67	1	1	0.33	1	0.67	1
20	0.67	0.33	0.33	0.67	0.67	0.67	0.67	1	0.67	0.67	0.67	0.33	0	0.33	0.33
21	0.67	1	0.33	0.67	0.67	0.67	0.67	1	0.67	1	0.67	0.33	0	0.33	0.67
22	1	1	0.67	0.67	0.33	1	0.67	0.33	0.67	1	1	0.67	0.33	1	1
23	1	0.67	0.67	0.67	0.67	1	0.33	1	0.67	1	1	0.33	0.33	1	1
24	0.67	0.67	0.67	0.67	0	0.67	0.33	0	0.67	0.67	1	1	0.33	0.67	0.67
25	1	1	0.67	0.67	0.33	0.67	0.33	1	0.67	0.67	0.67	1	0.33	0	1
26	0.67	0.67	0.33	0.33	1	0.67	1	0.67	1	0.67	0.67	0.67	0.67	0.67	0.67

Table 4: Necessary conditions analysis results

Pre-trip indicators(1)			Pre-trip indicators(2)			Mid-trip indicators		
	Consistency	Coverage		Consistency	Coverage		Consistency	Coverage
Optimism	0.866	0.936	Schedule	0.627	0.954	Activity	0.627	0.914
~Optimism	0.222	0.938	~Schedule	0.506	1.000	~Activity	0.432	0.906
Efficacy	0.807	0.982	Culturepercеption	0.565	0.884	Nature	0.461	1.000
~Efficacy	0.311	0.912	~Culturepercеption	0.494	0.944	~Nature	0.613	0.873
Empathy	0.642	0.978	Ambivalence	0.732	0.942	Culture	0.507	1.000
~Empathy	0.491	0.970	~Ambivalence	0.371	0.962	~Culture	0.641	0.977
Grit	0.748	0.980	Academicrecord	0.687	0.903			
~Grit	0.400	1.000	~Academicrecord	0.386	0.963			
Learning	0.611	0.932	Economy	0.882	0.908			
~Learning	0.492	0.971	~Economy	0.192	1.000			
Curiosity	0.748	0.980						
~Curiosity	0.400	1.000						

Note: "~" indicates the negation.

Table 5: Truth table of Pre-trip indicators (1)

Optimism	Efficacy	Empathy	Grit	Learning	Curiosity	Number	Outcome	Cases	Raw consist.	PRI consist.	SYM consist
1	0	0	1	1	1	1	0	20	0.936	0.886	0.886
1	1	1	1	1	1	7	1	5,6,8,9,13,19,23	1.000	1.000	1.000
1	1	0	1	1	1	5	1	3,4,14,17,21	1.000	1.000	1.000
1	1	1	1	0	1	4	1	16,22,24,25	1.000	1.000	1.000
1	1	0	1	0	0	1	1	11	1.000	1.000	1.000
1	1	1	1	0	0	1	1	12	1.000	1.000	1.000
1	0	1	1	1	0	1	1	10	1.000	1.000	1.000
0	1	1	0	0	1	1	1	18	1.000	1.000	1.000
1	1	1	0	0	1	1	1	1	1.000	1.000	1.000
1	1	0	1	0	1	1	1	7	1.000	1.000	1.000
0	0	1	1	0	1	1	1	15	1.000	1.000	1.000
1	0	1	1	0	1	1	1	2	1.000	1.000	1.000
1	1	0	0	1	1	1	1	26	1.000	1.000	1.000

Table 6: Truth table of Mid-trip indicators

Activity	Nature	Culture	Number	Outcome	Cases	Raw consist.	PRI consist.	SYM consist
0	0	0	6	1	9,10,14,18,20,21	0.943	0.915	0.915
1	0	1	6	1	1,2,11,16,22,24	1.000	1.000	1.000
1	0	0	5	1	5,6,7,17,25	1.000	1.000	1.000
0	1	0	2	1	3,4	1.000	1.000	1.000
1	1	0	2	1	8,12	1.000	1.000	1.000
0	1	1	2	1	13,19	1.000	1.000	1.000
1	1	1	2	1	15,26	1.000	1.000	1.000
0	0	1	1	1	23	1.000	1.000	1.000

Table 7: Truth table of Pre-trip indicators (2)

Schedule	Culture perception	Ambivalence	Academic record	Economy	Number	Outcome	Cases	Raw consist.	PRI consist.	SYM consist
1	1	1	1	1	5	1	3,15,20,21,26	0.951	0.932	0.932
1	0	1	1	1	5	1	4,7,8,16,22	1.000	1.000	1.000
0	0	1	1	1	4	1	5,13,17,24	1.000	1.000	1.000
1	0	1	0	1	3	1	11,12,18	1.000	1.000	1.000
0	1	1	1	1	3	1	19,23,25	1.000	1.000	1.000
0	1	0	1	1	2	1	1,2	1.000	1.000	1.000
0	0	0	0	1	1	1	6	1.000	1.000	1.000
1	0	0	0	1	1	1	9	1.000	1.000	1.000
1	1	1	0	1	1	1	10	1.000	1.000	1.000
1	0	0	1	1	1	1	14	1.000	1.000	1.000

Table 8: Sufficient condition analysis of pre-trip indicators (1)

Code	Optimism	Efficacy	Empathy	Grit	Learning	Curiosity	Coverage	Coverage	Consistency
A	○	○		○	●		0.402	0.030	1.000
B	○	○		○		○	0.598	0.106	1.000
C		○	○	●	●	○	0.296	0.030	1.000
D		●	○	○	●	○	0.237	0.030	1.000
E	○	○	●		○	○	0.416	0.015	1.000
F	○	●	○	○	○	●	0.237	0.015	1.000

Notes: ○ indicates the presence of a condition, ● indicates the absence (negation) and blank indicates no association. Solution coverage = 0.764, Solution consistency = 1.

Table 9: Sufficient condition analysis of mid-trip indicators

Code	Activity	Nature	Culture	Raw coverage	Unique coverage	Consistency
G	○			0.627	0.106	0.914
H		○		0.461	0.104	1.000
I			○	0.506	0.059	1.000

Notes: ○ indicates the presence of a condition, ● indicates the absence (negation) and blank indicates no association. Solution coverage = 0.835, Solution consistency = 0.934.

- Consistency: The degree to which each item of a solution is a subset of the outcome.
- Solution Consistency: The degree to which the solution is a subset of the result.
- Raw Coverage: The proportion of cases of a result covered by each of the items.
- Solution Coverage: The degree to which cases of a result are covered by the solution.
- Unique Coverage: The proportion of cases of a result described only in that item, not covered by other items.

Each condition combination is coded alphabetically for convenience. Table 8 presents the sufficient condition analysis results from Table 5, Table 9 from Table 6, and Table 10 from Table 7. A solution consistency of 0.75 or higher is typically taken as the threshold [Rihoux and Ragin 2009], making all results sufficient for the model.

Table 8:

- Shows many pathways, with the most strongly expressed being Condition B.
- Raw coverage is over 50 %, indicating about half of the 13 subjects have this combination of causal conditions: "Optimism * Efficacy * Grit * Curiosity."
- These subjects achieved positive self-transformation outcomes in the TPA of Sarawak.

Table 9:

- Indicates that the outcome can be reached if one of the agencies is exercised.
- Condition I shows approximately 63 % of the subjects can reach the outcome by enjoying activities such as hiking, even without a particular interest in natural or cultural elements.

Table 10:

- None of the intrinsic coverages is less than 10 %, meaning

those who meet one condition also meet the other conditions.

- Conditions K "Schedule * Ambivalence (travel style) * (household) Economy" and L "Ambivalence * Academic Record * Economy" have high raw coverage percentages of more than half.
- Both conditions have consistency above the threshold.
- Short scheduling time, high education and income, and ambivalent consumption tendencies align with the characteristics of adventure tourists revealed in previous studies.

4. Discussion

To begin with, Table 9 addresses the fact that, despite the natural richness of the TPAs, the agency for natural resources is not a required condition for the combination of other causal factors. In S-D logic, actors are expected to exercise agency and integrate resources [Lusch and Vargo, 2014]. However, adventure tourists may not adhere to this logic. For instance, regardless of how high the tourist's pre-trip indicators (1) (non-cognitive abilities) are, they cannot engage in lively activities in a tropical environment if they are not physically fit. Therefore, due to the intermediate factor of affordance for the individual, some participants with high non-cognitive abilities (in Table 4) may have scored all zeros (in Table 5) for exercising agency in activities involving natural and cultural elements (e.g., Cases 9, 10, 14, 18, 20, and 21). In these cases, the outcome should be low due to the presumed lack of resource integration. In other words, it should be interpreted negatively because they did not enjoy the experience. However, this is not the case in this study, as Table 5 indicates that many of the cases reached the desired outcome. Why is this the case?

The ability of the subjects to achieve the desired outcomes despite the lack of agency can be attributed to the disposition of cross-boundary learners. As indicated in Table 5, the non-cognitive abilities of the above-mentioned cases are not low. Instead, they exhibit high levels of optimism and curiosity, enabling them to act, cross boundaries, and visit the TPA in Sarawak without meticulous planning. The perception that individuals can exercise agency and engage in knowledge exploration, even without a clear and strong intention to visit a place, is due to their high non-cognitive abilities. However, it is only one aspect. The state of being 'active in not being active' cannot be termed agency, as it does not involve an action-oriented autonomy towards transformation. Conversely, it can be interpreted as the ability to switch to knowledge exploitation instead of knowledge exploration due to high non-cognitive abilities (e.g., in Case 21, an individual arrives at the TPA in sporty clothes with the intention of hiking, but, finds it too hot, switches to resting in a hammock on the beach). Indeed, Table 7 indicates that "Optimism * Efficacy * Grit * Curiosity" is one of the combinations of sufficient conditions, with Optimism and Grit suggesting a positive view of the future and the flexibility to adapt to it.

Furthermore, ambivalent values are well supported, as illustrated in Table 10. Cross-boundary learning encompasses both knowledge exploitation and knowledge exploration. Kirillova et al. [2017b] observed that a mixture of positive and negative emotions at end of the travel can generate peak experiences (happiness and fulfillment), leading to self-transformation. Additionally, it has been noted that positive emotions foster knowledge exploration [Schwarz and Clore, 2003], while negative emotions promote knowledge exploitation [Forges and George, 2001]. Thus, both knowledge exploitation and knowledge exploration can occur simultaneously, forming contextual values, or a choice between the two may also be possible.

Conversely, even if the transformative tourist is unable to exercise agency in 'knowledge exploration' due to inhibiting factors, they can switch to 'knowledge exploitation' using their effectivities (non-cognitive abilities) and integrate resources into positive change. This choice between knowledge exploration (unlearning), knowledge exploitation (experiential learning), or both (cross-boundary learning) is illustrated in Figure 1. The vertical axis shows the interaction of the three dispositions referred to in Section 2.1. The right red square (c) indicates that the adventure tourist does not 'dare' to exercise agency but can generate it as a positive context for themselves, whereas the dotted red square (d) signifies that they do not perceive it as a negative context.

The paradigm of achieving high added value through excellent service in ISO 23592 and ISO/TS 24082 has been discussed in recent years concerning service sophistication. However, adventure tourists are not limited to this. Blocker and Barrios [2015] referred to transformative value as a social dimension of value creation that generates uplifting change for greater well-being. This value can arise when organizations

Table 10: Sufficient condition analysis of pre-trip indicators (2)

Code	Schedule	Culture perception	Ambivalence	Academic record	Economy	Raw coverage	Unique coverage	Consistency
J	○	●			○	0.388	0.015	1.000
K	○		○		○	0.537	0.030	0.972
L			○	○	○	0.538	0.076	0.973
M		●	●	●	○	0.134	0.015	1.000
N	●	○		○	○	0.327	0.060	1.000

Note: ○ indicates the presence of a condition, ● indicates the absence (negation) and blank indicates no association. Solution coverage = 0.779, Solution consistency = 0.980.

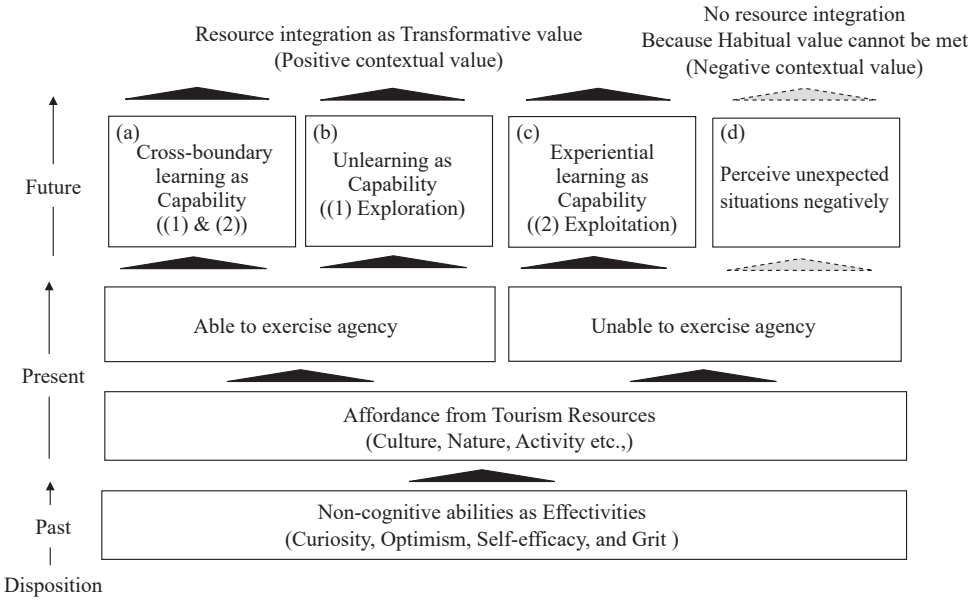

Figure 1: Layout of figures and tables

Note: The author had translated and made additions based on the reference to Akaho (2024c).

and individuals challenge and modify the schemas and resources that define their consumption reality and broader social structures. It distinguishes transformative value from habitual value, which is obtained by merely meeting expectations and needs [Blocker and Barrios, 2015]. When facing unexpected "disorienting dilemmas" in everyday life before the commodification of destinations—usually perceived as negative—the left blue square (a) (b) represents a unique customer image that can be recognized as positive contextual value by challenging one's existing worldview through disorienting dilemmas. Figure 1 illustrates how the transformative tourist perceives the value proposition in S-D logic [Lusch et al., 2008] and creates contextual value. The 'context value' in value co-creation refers to the integration of resources, such as users' capabilities and the environment, which alters the context of the value derived from goods and services [Vargo et al., 2010].

Moreover, Table 9 indicates a weak relationship between outcomes and interest in different cultures, aligning with findings from previous studies. To examine this, the tourism providers surveyed in this study do not present the local people's lifestyle as a tourism resource, despite these resources being available in and around the areas. For instance, in Bako National Park and Fairy Cave Nature Reserve, hiring a park guide provides the first opportunity to learn how local people traditionally utilize the diverse flora and fauna in the park. Given this situation, it can be inferred that only a small number of subjects opted for guided tours, indicating that while operand resources, such as landscapes, flora, and fauna, were abundant, the provision of operant resources by park guides and local people was insufficient.

One limitation of this study is the importance of the park guides. Conversely, it has been noted that Servitization (e.g., English language support) has been implemented at the experimental sites, potentially represented by the red square (c) in Figure 1. It is assumed that those who were unable to exercise agency in knowledge exploration were encouraged to switch to knowledge exploitation.

5. Conclusion

This study examined adventure tourists as cross-boundary learners within the framework of transformative tourism. Focusing on foreign tourists visiting TPAs in Sarawak, Malaysia, it investigated how non-cognitive abilities, agency, and self-transformation interact through the lens of actor engagement.

The findings suggest that tourists possessing high levels of curiosity, optimism, self-efficacy, and grit are more likely to experience self-transformation. In addition, the results support previous studies indicating that transformative tourists tend to exhibit ambivalent travel styles, relatively high educational backgrounds, and stronger economic capacity. Importantly, the study found that self-transformation may occur even when tourists do not actively exercise agency toward cultural or natural resources. Rather than continuously engaging in knowledge exploration, transformative tourists appear capable of flexibly shifting between knowledge exploration and knowledge exploitation depending on situational affordances.

These findings support the interpretation of adventure tourists as cross-boundary learners whose transformative potential is strongly shaped by non-cognitive abilities. Self-transformation can therefore function both as a motivation for travel and as an outcome of travel experiences. From a practical perspective, the results suggest that tourism providers should focus not only on travel motivations and demographic attributes, but also on the dispositions that enable tourists to engage with unfamiliar contexts. Facilitators such as local guides and collaborative learning opportunities may further support transformative ex-

periences.

This study has several limitations. Because the research focused primarily on transformative tourists in Sarawak, comparisons with non-transformative tourists were not possible. Future studies should incorporate comparative designs and larger samples to further examine the causal mechanisms underlying transformative tourism. Expanding the use of two-step QCA proposed by Schneider and Wagemann [2006] may also improve the analytical precision of future research.

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This manuscript is based on a portion of the author's doctoral dissertation, "Unravelling the Learning Mechanisms of Transformative Tourists: A Case Study of Adventure Tourists in Sarawak, Malaysia" (originally published in Japanese), submitted to the Japan Advanced Institute of Science and Technology in 2024 under the guidance of Dr. Asami Shikida. This manuscript re-examines the results based on the dissertation by raising the consistency threshold to 0.95, in an attempt to make the method more robust. We have also revised our discussion of transformative value, which forms the core of this paper. Typically, if expectations are met, such value is integrated into habitual value. However, even when expectations are not met, high non-cognitive abilities can still lead to integration into habitual value because this value is one that the individual has newly discovered for themselves. Therefore, we determined that it is appropriate to classify (c) in Figure 1 as transformative value rather than habitual value, and have made the necessary revisions. This research investigation was funded by the Science and Technology Research Partnership for Sustainable Development by the Japan Science and Technology Agency and the Japan International Cooperation Agency (Principal Investigator: Dr. Takao Ichioka, Research Title: The Project on Development of Management Systems for Multiple Utilization of Biodiversity in the Tropical Rainforests at the Totally Protected Areas in Sarawak). Despite travel restrictions due to the COVID-19 pandemic, we were able to conduct the field survey thanks to the dedicated efforts of Dr. Ichioka and other project staff and officials from the Sarawak Forestry Corporation. We would like to sincerely thank them for their invaluable support.

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